Studies on the Motion Behaviour of Paper during Ink Transfer

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Studies on the motion behavious of paper during ink transfer

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Preliminary paper
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A. General

Study of motion behaviour of paper during ink transfer is one of the printability problems. It may be stated generally that paper does not detach itself immediately from the inked printing form after leaving the printing zone but somewhat later. It is the special merit of Borchers and Bruno (1) as well as of Reed(2) for having pointed out this phenomenon and for having looked into it more closely.

The Institute for printing machinery and printing processes at the TECHNISCHE HOCHSCHULE DARMSTADT experimentally investigated the motion behaviour of the paper in the printing process and the forces appearing at the gripping point by means of an offset printability (test) system.

It will be most instructive to first view a slow motion film taken with a Fastax camera this process which is particularly pronounced in offset printing.

SLOW MOTION FILM ON THE DETACHMENT OF THE
PRINTED PAPER FROM THE INK BLANKET CYLINDER

The film just shown demonstrates that the motion behaviour of the paper during the printing process shows certain peculiarities. Not only does the paper adhere to the blanket cylinder after leaving the printing zone but as the cylinder is turning it also peels off from the ink layer with increasing delay in relation to the printing start.

B. Research apparatus

The following diapositive shows the apparatus which is suitable for detailed research; it consists of a printability test system connected with a sheet-fed rotary offset machine, the cinematographical instrument set-up as well as the electronic measuring and control devices.

Fig.1 RESEARCH APPARATUS

It is emphasized that by using a controllable spark light source (3) great sharpness of motion is assured and by using a special 2 objective type drum camera it was made possible to register the forces transferred from the paper to the piezoelectrical pick-up true to phase with the motion process.

The next diapositive shows the essential details of the printability test system.

Fig.2 PRINTABILITY TEST SYSTEM

A film strip series taken with this arrangement is shown in the following picture.

Fig.3 MOTION AND FORCE PATTERN DURING PRINTING PROCESS
(The paper has been retouched in this reduced presentation for the sake of clarity.)

C. Results

Some characteristic test results are summarized in the next picture.

Fig.4 TEST RESULTS
(These preliminary curves of the tests may be incorrect in some way because the climate could not be held sufficiently constant during the time of the tests.)

The curves given characterize the point at which paper is peeled off the blanket and the force of pull applied at the gripping point as a function of cylinder position; they inform especially on the very specific behaviour of different papers. Among the paper characteristics influencing them most are absorbency, stretch behaviour, bending resistance (4) and surface smoothness.

In this manner it is therefore possible to gain immediate insight into the mutual relationship between printing ink and paper during the printing process. The changing contact time between ink and paper during the printing process influences the setting of binding agent components and therefore pick resistance. It should be pointed out in this connection that the tear-off acceleration which is depending on the nip form - Rupp and Rieche (5) use them for a comparative valuation of picking speeds - does not depend on the machine system only but essentially also on the geometrical conditions prevailing during the peeling process of the paper.

(4) Brecht,W. and Müller,F.: Über die Steifigkeitsprüfung von Papieren, Kartons und Pappen. Z."Das Papier" 14.Jg. (1960) Heft 7 S. 270-277 und Heft 9 S. 414-422.

(5) Rupp,E. and Rieche,K.: Beiträge zur Bedruckbarkeit von Papier und Folien. Institut für Grafische Technik, Leipzig, (1959) S. 29-34.

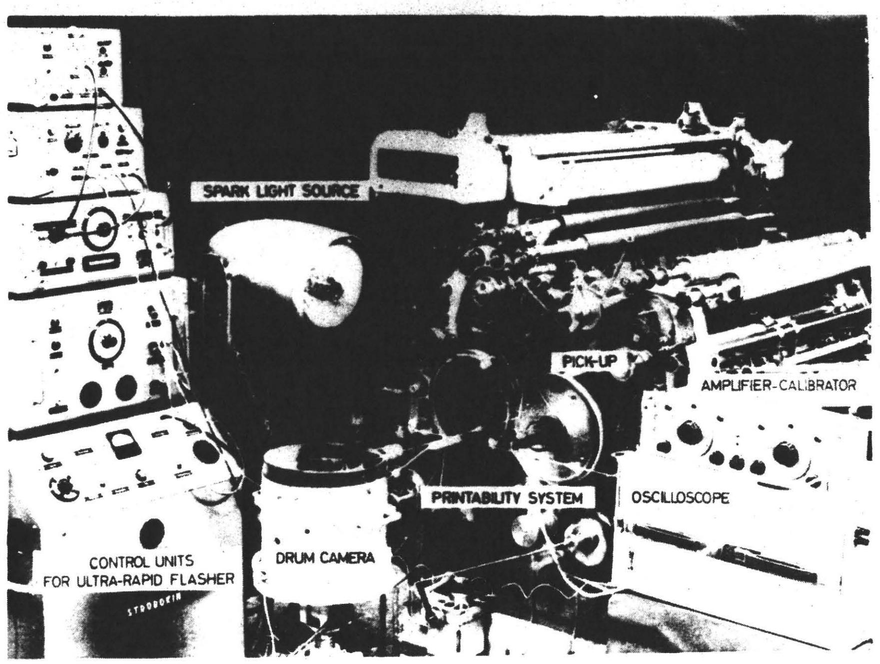

Fig. 1

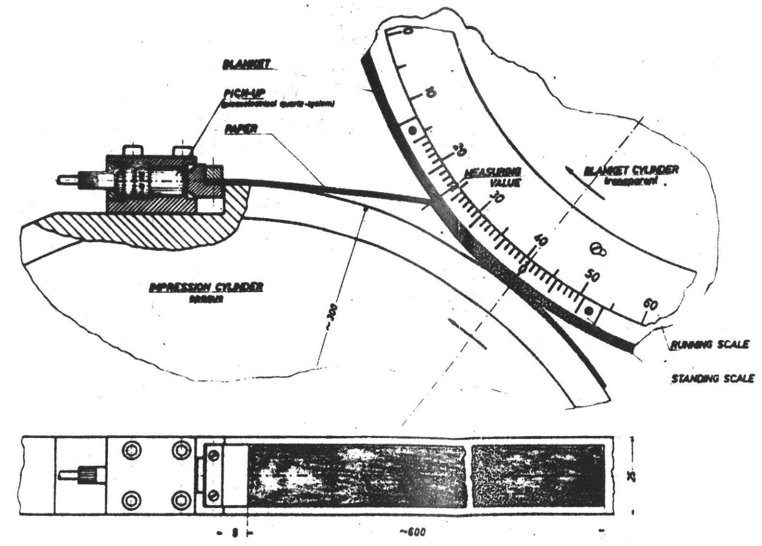

Fig. 2

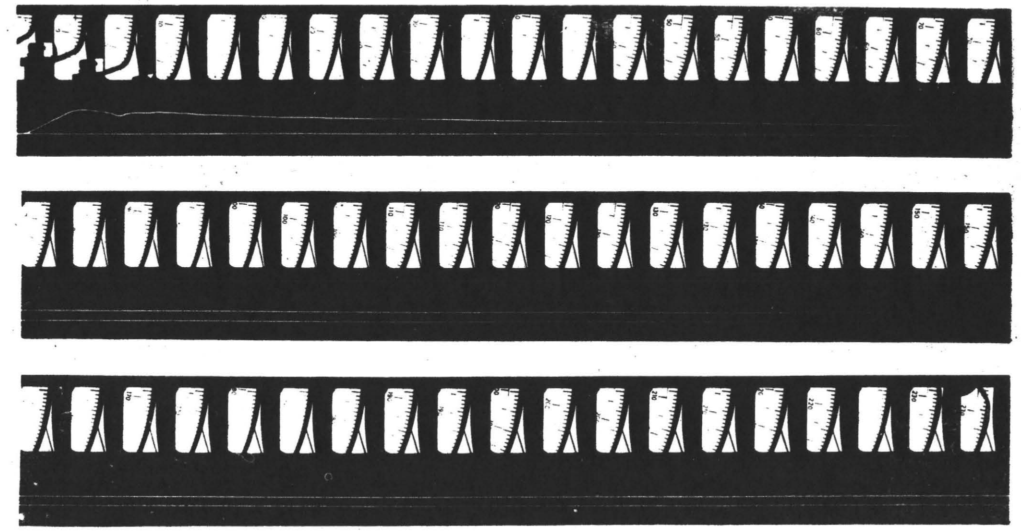

Fig. 3

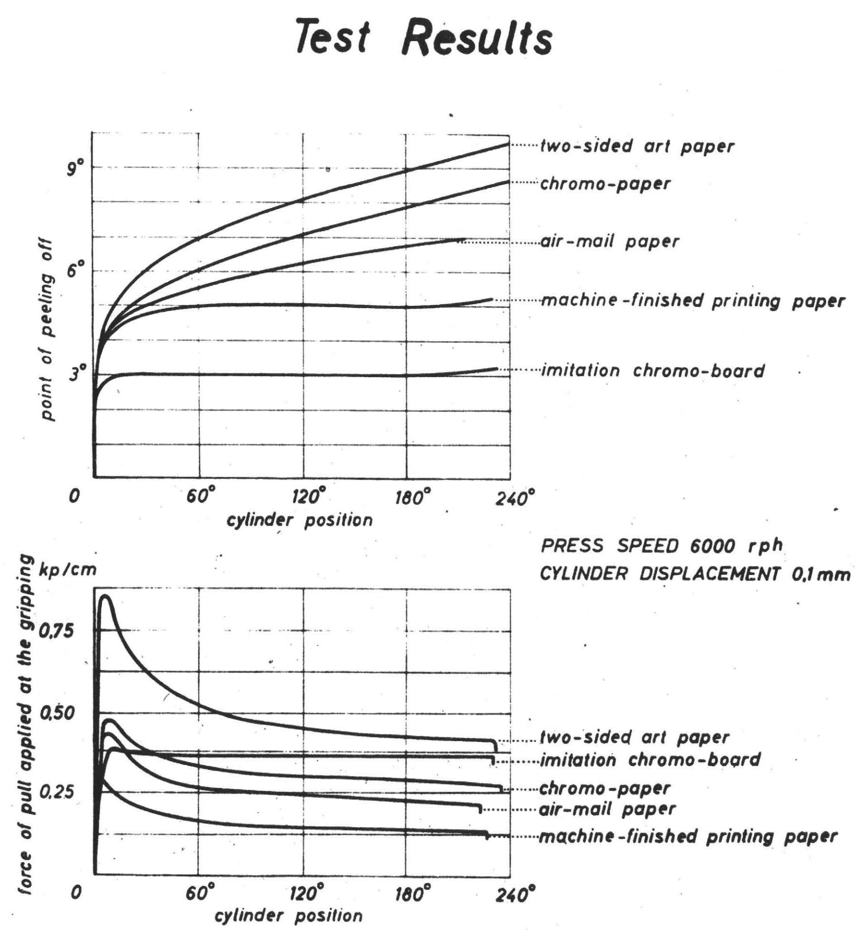

Fig. 4

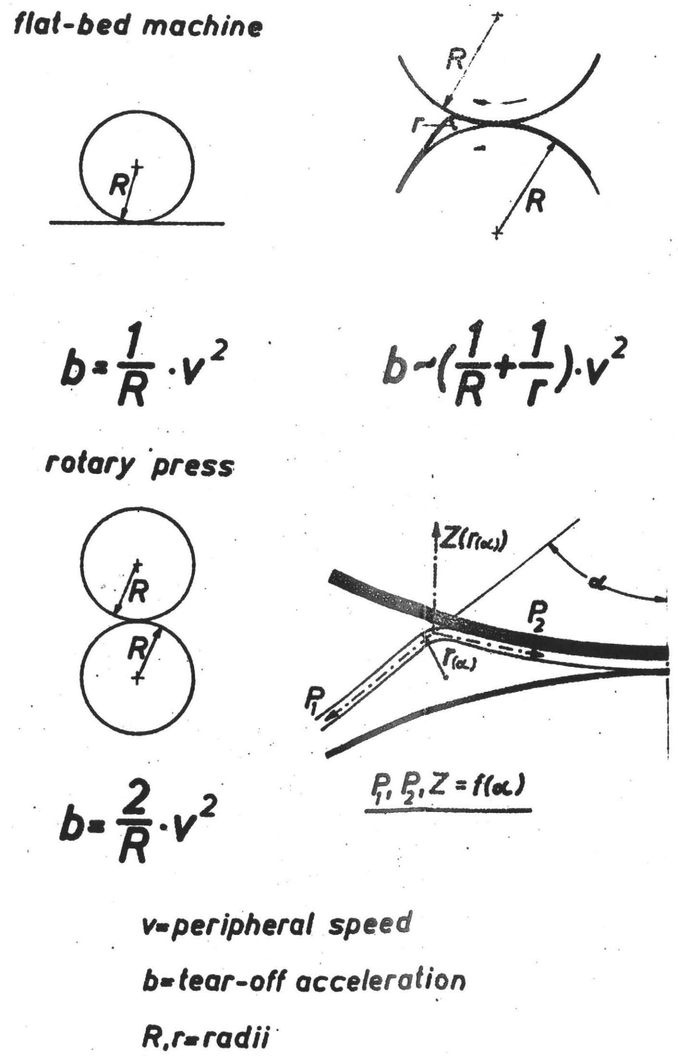

Fig. 5

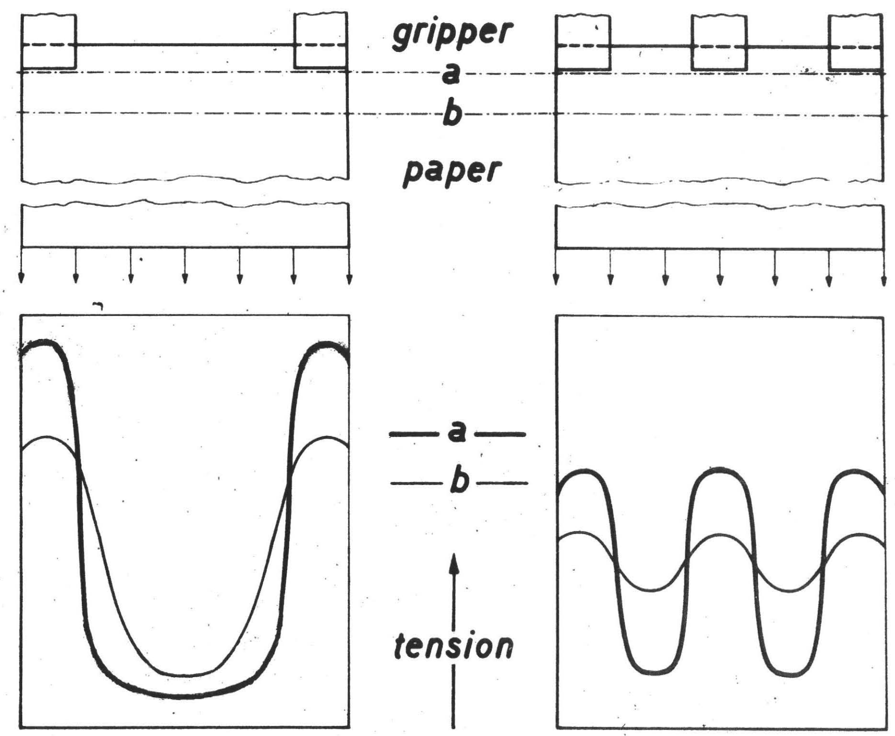

Fig. 6